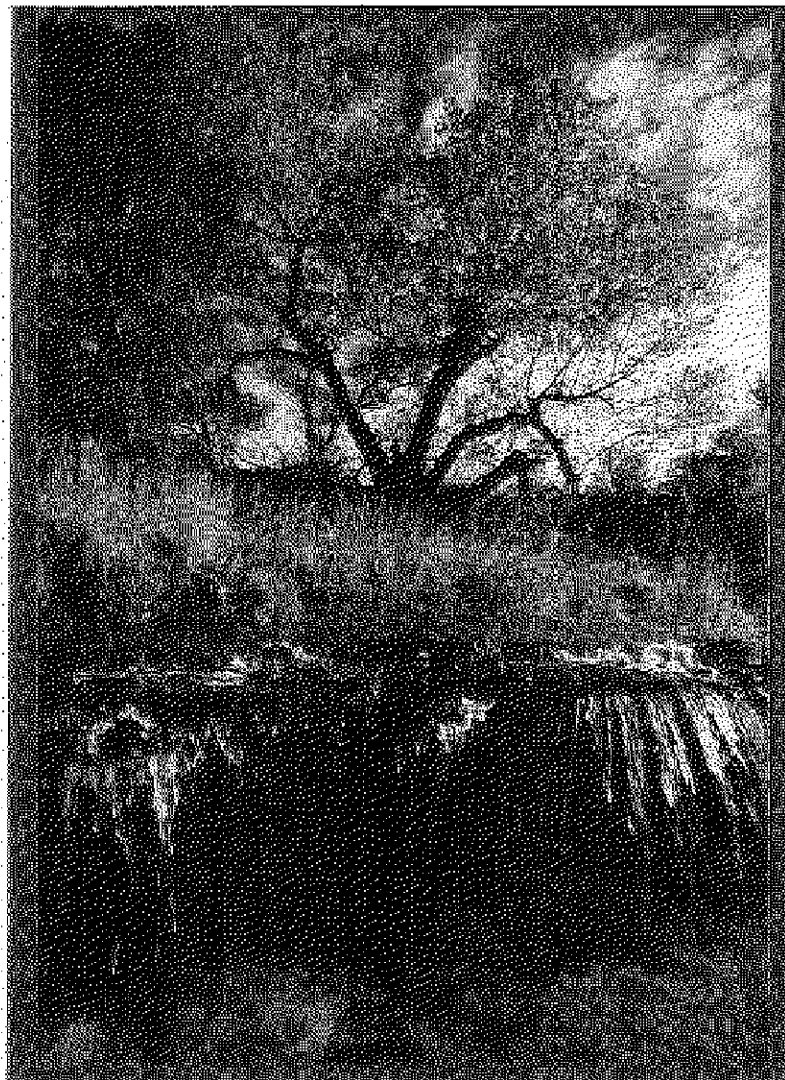


DEVELOPING AN INTEGRATED HYDROGEOMORPHIC
MODEL FOR RIVER RESORATION AND WATER
ACQUISITION IN THE CENTRAL VALLEY

998-160



A Request from Category III
of the CALFED Bay-Delta Program

Submitted by:
The Trust for Public Land

4.5 PSP Cover Sheet (Attach to the front of each proposal)

Developing an Integrated Model for River Restoration and
Water Acquisition in the Central Valley
Proposal Title: _____
Applicant Name: Nelson Mathews, Western Rivers Program Director
Mailing Address: TPL, 116 New Montgomery, 3rd Floor, San Francisco, CA 9410
Telephone: 415/495-5660
Fax: 415/495-4020
Email: Nelson.Mathews@tpl.org

Amount of funding requested: \$294,362 for 2.5 years

Indicate the Topic for which you are applying (check only one box).

- | | |
|---|---|
| <input type="checkbox"/> Fish Passage/Fish Screens | <input type="checkbox"/> Introduced Species |
| <input checked="" type="checkbox"/> Habitat Restoration | <input type="checkbox"/> Fish Management/Hatchery |
| <input type="checkbox"/> Local Watershed Stewardship | <input type="checkbox"/> Environmental Education |
| <input type="checkbox"/> Water Quality | |

Does the proposal address a specified Focused Action? ☒ yes ☐ no

What county or counties is the project located in? All Central Valley

Indicate the geographic area of your proposal (check only one box):

- | | |
|---|---|
| <input type="checkbox"/> Sacramento River Mainstem | <input type="checkbox"/> East Side Trib: _____ |
| <input type="checkbox"/> Sacramento Trib: _____ | <input type="checkbox"/> Suisun Marsh and Bay |
| <input type="checkbox"/> San Joaquin River Mainstem | <input type="checkbox"/> North Bay/South Bay: _____ |
| <input type="checkbox"/> San Joaquin Trib: _____ | <input type="checkbox"/> Landscape (entire Bay-Delta watershed) |
| <input type="checkbox"/> Delta: _____ | <input checked="" type="checkbox"/> Other: <u>Central Valley Rivers</u> |

Indicate the primary species which the proposal addresses (check all that apply):

- | | |
|---|---|
| <input checked="" type="checkbox"/> San Joaquin and East-side Delta tributaries fall-run chinook salmon | <input checked="" type="checkbox"/> Spring-run chinook salmon |
| <input checked="" type="checkbox"/> Winter-run chinook salmon | <input checked="" type="checkbox"/> Fall-run chinook salmon |
| <input checked="" type="checkbox"/> Late-fall run chinook salmon | <input checked="" type="checkbox"/> Longfin smelt |
| <input checked="" type="checkbox"/> Delta smelt | <input checked="" type="checkbox"/> Steelhead trout |
| <input checked="" type="checkbox"/> Splittail | <input checked="" type="checkbox"/> Striped bass |
| <input checked="" type="checkbox"/> Green sturgeon | <input checked="" type="checkbox"/> All chinook species |
| <input checked="" type="checkbox"/> Migratory birds | <input checked="" type="checkbox"/> All anadromous salmonids |
| <input type="checkbox"/> Other: _____ | |

Specify the ERP strategic objective and target (s) that the project addresses. Include page numbers from January 1999 version of ERP Volume I and II.

More closely approach the natural (unimpaired) seasonal Delta outflow pattern (General Target, page 88, Vol. II, EERP), etc. as detailed herein.

I. TITLE PAGE

- a. **Project Title**
Developing an Integrated Model for River Restoration and Water Acquisition in the Central Valley
- b. **Applicant**
The Trust For Public Land
Nelson Mathews
Western Rivers Program Director
116 New Montgomery Street
Suite 300
San Francisco, CA 94105
Phone: (415) 495-5660
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- c. **Type of Organization and Tax Status**
Non profit 501(c)(3)
- d. **Tax Identification Number**
650768
- e. **Collaborators**
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(Cover Photo by Rob Badger)

II. EXECUTIVE SUMMARY

PROJECT TITLE & APPLICANT NAME

Project Title: Developing an Integrated Hydrogeomorphic Model for River Restoration and Water Acquisition in the Central Valley

Applicant Name: The Trust for Public Land (TPL), Nelson Mathews, Western Rivers Program Director (415) 495-5660

PROJECT DESCRIPTION & PRIMARY ECOLOGICAL OBJECTIVES

We will develop a multi-objective flow management methodology for the lowland regulated rivers of the Central Valley. This science-based methodology will provide the framework for restoration and preservation of priority species and habitats throughout the Central Valley, while taking into account other societal objectives. It will be useful in guiding land and water purchases by private entities, informing the implementation of the flow-related actions identified in CalFed's ERPP, and in achieving the overall ecosystem restoration goals identified in the Strategic Plan. Application of this work will ultimately address the restoration needs of the following **priority species and habitats identified in the CalFed ERPP: salmon (all runs), steelhead, green sturgeon, splittail and possibly Delta smelt; and instream aquatic, shaded riverine aquatic, and tidal perennial aquatic habitat (freshwater).**

APPROACH & SCHEDULE

Phase I: Develop a **conceptual model for restoration of a regulated river** that incorporates the relationship of hydrologic and geomorphologic processes to key biotic functions of the river system. The foundation of the model will be identifying the essential characteristics that must be preserved in a river's hydrograph to maintain riverine, riparian, and floodplain dependent species that have evolved in response to seasonal and interannual variability. The conceptual model will maximize the achievement of multiple objectives in the management and restoration of Central Valley rivers. **Phase II:** Develop a **water acquisition prioritization framework** for the Central Valley based on the conceptual model. Water acquisition could include water rights, water storage and diversionary rights. This framework will be essential in identifying the most ecologically-valuable increments of water needed on any given river.

Phase III: Perform a **pilot basin study** of a specific Central Valley river using the conceptual model and framework. We will include existing water and flood management strategies, and consider reservoir re-operation and water acquisition in identifying opportunities for alternatives to accomplish multiple user, process, and species objectives. The costs, benefits, and impacts of several management alternatives - relative to the existing management regime - will be approximated.

Phase I will be completed within 9 months of receiving funding. Phase II would then be completed within a 6 month timeframe, and the pilot basin study in Phase III would then be completed in 12 months. Field testing of these tools would occur as a component of implementation of TPL's Western Rivers Program.

COMPATIBILITY WITH CALFED GOALS & OBJECTIVES

This project is compatible with CalFed ecosystem restoration objectives and actively supports several specific goals as described in the ERPP and the Strategic Plan: 1) Recovery of species of concern including salmon, steelhead, Delta smelt, splittail, and longfin smelt; 2) Rehabilitation of natural processes in the Bay-Delta system and support of natural biotic and aquatic communities on which fish species of concern depend; and 3) The protection and restoration of functional habitat types throughout the watershed critical for recovery and sustainability of healthy fish populations.

COST

We request funding in the amount of \$294,362 to cover completion of technical and project management work. Phase I will cost \$87,770; Phase II will cost \$65,327; and Phase III will cost \$141,265. TPL, as applicant, will serve as Project Manager providing oversight of technical work and administrative support. TPL is currently seeking funding from the Packard Foundation, the Crocker Foundation, and others, to complement anticipated CalFed funding in support of its new Western Rivers Program through which this methodology and prioritization framework will ultimately be implemented.

MONITORING AND EVALUATION

Model outputs and analyses will be submitted at the completion of each phase. Monitoring and the collection of new hydrogeomorphic, and ecological data in a given stream will occur during application of these tools. This data would be useful in building CMARP databases.

COORDINATION WITH OTHER PROGRAMS

This will provide a valuable tool for all agencies and non-profits interested in pursuing water acquisitions for restoration of the Central Valley Rivers.

ADVERSE AND THIRD PARTY IMPACTS

We do not anticipate any adverse or third party impacts as a result of this work. This is merely the development of a model and methodology. The potential for any third party impacts would be well examined with actual water acquisitions.

APPLICANT QUALIFICATIONS

The Trust for Public Land (TPL) is a national, nonprofit conservation organization with over 26 years of experience in acquiring critical land and water resources from willing sellers for restoration and preservation. TPL's core competencies are in business, finance, law and real estate. The Western Rivers Program is a new initiative through which TPL seeks to preserve and restore naturally functioning rivers and improve water quality through market-based solutions. TPL will oversee the work of technical consultants Elise Holland and Philip Williams & Assoc. LTD (PWA). Elise has experience in fisheries management and stream ecology. She has served as a technical analyst and advisor to Congressional committees on fisheries and water diversion issues, and as a private consultant on other land- and water-use issues. PWA is a consulting firm with expertise

in hydrology and related disciplines and has more than 20 years of experience in performing this type of conceptual and computer model development and technical analysis.

III. PROJECT DESCRIPTION

Context

Restoration scientists in the Central Valley are faced with understanding what **the relationship of river flows is to ecological productivity in the Estuary given the altered morphology and diminished hydrograph** of rivers in the Bay-Delta watershed. In most cases, the alteration of hydrologic and geomorphic processes is the most important factor in the degradation or loss of sustainable ecosystems, and conversely, in the restoration of ecosystems and species on which they depend. We believe that any large-scale ecosystem restoration program in Central Valley rivers must address this overarching issue directly.

The flow regime, or hydrograph, of a river is critical to its ecological productivity because there is an interaction between biota and the physical processes for riverine, riparian, and floodplain habitats. It is the restoration of physical processes – both hydrologic and geomorphologic – that will ultimately support the ecological processes on which key species depend. The fisheries of the Central Valley are adapted to the periodicity and magnitude of the flows of the river systems in which they evolved. Changes in flow periodicity and magnitude greatly alter or eliminate the physical habitat available to these fishes and other taxa.

The CalFed program mission addresses the mismatch between current water management and ecological health in the Bay-Delta system. This can be resolved in part by understanding the interactions between physical and ecological processes and river management regimes and then developing alternative strategies for meeting CalFed's multiple river management objectives. As a result, **a science-based methodology is needed to guide the appropriate modification of regulated river flows to improve hydrogeomorphic and ecological processes that will achieve ecosystem restoration.** We propose to develop and evaluate such a methodology as this project.

Project Scope

The key to ecosystem restoration in Central Valley rivers, therefore, is **to provide the appropriate amount of water at the right time and in the right place to support hydrogeomorphic and ecological processes on which healthy populations of important fish species depend.** Our work will focus on the management of major lowland rivers of the Bay-Delta watershed. This will ultimately support the restoration of the flow regime and related ecological processes of the estuary by reducing or perhaps eliminating certain flow related stressors.

The methodologies and analyses we will develop as part of this project will improve the collective understanding of the interrelationships between the hydrologic, geomorphologic, and ecological processes that combine to support healthy and

sustainable ecosystems and ultimately the restoration of threatened and endangered fish species. Three useful products will be produced as a result of this work:

1) A conceptual model that describes an improved flood regime in regulated rivers;
2) A mechanism for achieving these modifications in flows through re-operation and water acquisition. 3) An evaluation of the application of these tools to a specific Central Valley river.

The use of a science-based methodology for Central Valley river management will be critical in guiding the implementation of many of the flow-related actions identified in CalFed's ERPP and the CVPIA, and in achieving overall ecosystem restoration goals identified in the Strategic Plan. As adaptive approaches to applying acquired water in certain stream reaches proceeds, the linkages between healthy ecosystem attributes and the effects of stressors (i.e., inadequate stream flow) on the Bay-Delta-River system will become better understood, thereby improving ecosystem management decisions.

Approach/Products/Schedule:

Phase I: Development of a **conceptual model of a restoration hydrograph for regulated rivers in the Central Valley** will focus on restorative hydrology and geomorphology for regulated lowland rivers, identifying their relationship with affected ecological processes. Specifically, timing, magnitude, duration, and variability of flow and flood frequency, indicating periodicity patterns necessary to support physical and ecological functions, will be identified. Assumptions may be made about channel morphology, for the sake of developing the methodology (e.g., incised, significantly levied and incised, intact), as they will affect the desired characteristics of the restoration hydrograph. We will also identify related considerations on regulated rivers that will affect the desired hydrograph (e.g., elimination of flood peaks, reduction of flow for downstream diversions, and diversion of river flow at a reservoir).

Particular attributes of ecological integrity will be the indicators for achieving healthy functioning aquatic ecosystem. This work will culminate in the development of a conceptual model of river management for ecosystem restoration given multiple management objectives on Central Valley rivers.

Product: Conceptual Model of a Restoration Hydrograph for Regulated Rivers

A science-based restoration hydrograph that incorporates physical and ecological processes contributing to a healthy aquatic system on a regulated river will be produced. The conceptual model, on which the hydrograph is based, will be described in a report discussing the basis of the model in relationship to general restoration objectives, competing river management objectives, and resulting strategies for successful river management and restoration. This model will help guide decision-making for restoration, as well as provide a basis for the water acquisition framework. We anticipate that **Phase I could be completed in 9 months**. This phase is separable from the latter phases.

Phase II: We propose the development of a **water acquisition prioritization framework** as Phase II of our work. This framework will build on the model developed in Phase I to determine a weighting system identifying the most ecologically-valuable flow increments balanced against competing water uses for a generalized river model. Water acquisition could include water rights, water storage and diversionary rights. Water acquisition could include water rights, water storage and diversionary rights. An acquisition program that is based on hydrogeomorphic and ecosystem process requirements could be very promising as a mechanism for acquiring the most ecologically-valuable water in any given watershed. This framework will consider overall ecosystem processes as well as the identified biological needs for improved instream flows including spawning, rearing, and migration flows for salmon and steelhead, and enhanced habitat conditions for splittail, longfin smelt, and Delta smelt.

Product: Water Acquisition Framework

An environmental water acquisition framework will be produced as a result of Phase II. A project report will describe the framework, which is a methodology for identifying the most ecologically-valuable increments of water that should be purchased on the lowland rivers of the Central Valley to meet hydrogeomorphic and ecological process restoration goals, and ultimately support recovery of endangered and threatened species. This framework will be an essential step in implementing restoration strategies through the Central Valley Project Improvement Act, and the ERPP. **Phase II could be completed in 6 months.** This phase is dependent on the completion of Phase I.

Phase III: We will undertake a **pilot basin study** by applying the restoration hydrograph and water acquisition framework to the particular circumstances of a yet to be determined lowland river in the Central Valley. This analysis would incorporate existing water management and flood management strategies and water uses in the watershed, and opportunities for alternative management strategies including reservoir re-operation and water acquisition, to accomplish multiple user, physical process, and species objectives.

Product: Pilot Basin Study

An adaptable water management model will be developed for a particular river basin and used to test alternative management strategies using the water acquisition framework. This model and generated data will reflect several strategies that could be implemented on the selected river, and also serve as the basis for application on other rivers in the Central Valley. This work will include analysis of costs, benefits, and impacts – both environmental and economic – relative to the existing management regime will be approximated. **Phase III could be completed in 12 months.** This Phase is dependent on completion of the prior phases.

IV. ECOLOGICAL AND BIOLOGICAL BENEFITS

Ecological/Biological Objectives

This project responds specifically to the request for **General Bay-Delta Focused Actions** described on page 19 of the PSP: *Develop ecologically-based hydrologic models and water management strategies*. Further, as described on page 19, this project will facilitate improved instream flows in high priority areas, improve our understanding of the hydrologic, geomorphic and ecological relationships, and assist in evaluation of alternative water management strategies.

The primary ecological/biological objectives for the project are:

1) Develop a methodology for managing rivers that is consistent with achieving appropriate hydrogeomorphic conditions to eliminate abiotic and biotic stressors, associated with altered stream flows, that ultimately impact anadromous and estuarine species. 2) Apply this methodology in development of a management strategy for a real river in the Central Valley to improve abiotic and biotic conditions supportive of ecosystem restoration.

Our overarching hypothesis is that an appropriate river management regime, that incorporates physical as well as ecological processes, will ultimately lead to greater success in ecosystem restoration efforts with significant improvement in sustainable physical process and ecological indicators. This project will develop the details of that hypothesis -- the description of a restoration hydrograph for Central Valley lowland rivers in general, and specific management recommendations for one basin in particular. The testing of this hypothesis will occur during the application of these tools on a river in the Central Valley.

The development and application of this work will address the restoration needs of the following **priority species and habitats: salmon (all runs), steelhead, striped bass, splittail and possibly Delta smelt; and instream aquatic, shaded riverine aquatic, and perhaps tidal perennial aquatic habitat (freshwater)**. The primary stressor to be addressed through application of these tools is **insufficient instream flows**. This stressor has bearing on many others, including: **inadequate sediment budget, lack of connectivity between channel and floodplain, insufficient or lack of availability of spawning, rearing, migration, and refugia habitat, lack of channel migration, lack of diversity of aquatic habitats, availability of food supply, etc.** This work will be useful in guiding the implementation of programs focused on the rehabilitation of natural processes.

Through the course of our work, we will examine the following critical questions in developing the restoration hydrograph and water acquisition framework:

What are the essential characteristics that must be preserved in a river's hydrograph to

- accommodate the native species and assemblages as well as ecological processes that have evolved in response to that natural variation?
- What characteristics are essential to preserve the channel morphology most desirable from both a fish habitat and land management perspective?
- What are the key characteristics of flood plains that must exist to provide healthy floodplain ecosystems, healthy riparian vegetation, and key seasonal floodplain functions to support key species and flood management goals?
- How might reservoir systems be reoperated so as to improve habitat conditions for species of concern, with modest or no impacts on water supply, while supporting flood management objectives?
- How might opportunities for environmental water acquisition contribute to the successful management and restoration of Central Valley rivers and the ecosystem as a whole?
- What are the most ecologically significant flow increments on a river supporting endangered salmonids?

Linkages

The development of these tools will culminate in an **adaptable model that could help guide CalFed's efforts in implementing ERPP actions in any basin, and Interior's efforts in implementing the CVPIA (b)(3) water acquisition program and Anadromous Fish Restoration Program actions**. Ultimately, we believe that the application of these tools will provide a better basis for CalFed to determine whether **alternative river management strategies - including reservoir re-operation and water acquisition - will accomplish multiple flood management and ecosystem restoration objectives** in an efficient and effective manner. This approach also supports the concepts of adaptive management and/or probing as defined in the Strategic Plan.

Implementation of this approach, within the context of Stage I of the long-term CalFed program, would assist in:

- making progress toward meeting short-term ERP, flood management and water supply reliability objectives**, such as the development of information to support improved integrated management of the water storage and delivery system and the ecosystem,
- improving physical and biological properties** that support healthy and sustainable ecosystems, and
- contributing towards the **prevention of future listings under the state and federal Endangered Species Acts**

As described in the ERPP, this project specifically addresses these references in Vol. II of the ERPP:

General Target on page 88 associated with Central Valley stream flows and ecological processes:

More closely approach the natural (unimpaired) seasonal Delta outflow pattern.

The project also comports with the Rationale on page 89:

Changing the seasonal pattern of freshwater flows into and through the Delta will help restore the Delta's ecosystem processes and functions. This ecosystem restoration is fundamental to the health of aquatic, wetland, and riparian resources.

And supports Target 1 under Natural Floodplain and Flood Processes on page 186:

Increase and maintain flood plains in conjunction with stream meander corridor restoration (on the Sacramento River).

And Target 1 under Freshwater Fish Habitat and Essential Fish Habitat on page 188:

Maintain and improve existing freshwater fish habitat and essential fish habitat through the integration of actions described for ecological processes, habitats, and stressor reduction or elimination.

And Target 1 under Ecological Processes and CV Stream flows on page 399:

Manage flow releases from tributary streams to provide adequate upstream and downstream passage of fall-run and late-fall-run Chinook salmon, rainbow trout, and steelhead and spawning and rearing habitat for American shad, splittail, and sturgeon from the Merced River confluence to Vernalis.

System-Wide Ecosystem Benefits

The development of a conceptual model for river restoration, a methodology for integrated management, and water acquisition framework, that emphasizes the processes that will increase and sustain target species, and the habitats on which they depend, will ultimately advance the goals of the ERPP. **The application of this work will ultimately advance the achievement of CalFed's goals and objectives, as described in the ERPP and in the Strategic Plan, specifically:**

Recovery of at risk native species including salmon, steelhead, Delta smelt, splittail;

Rehabilitation of natural processes in the Bay-Delta system and support of natural biotic and aquatic communities on which these fish depend;

Protection and restoration of functional habitat types throughout the watershed for recovery and sustainability of healthy fish populations.

Compatibility with Non-Ecosystem Objectives

Flood control and management in Central Valley rivers could be improved through application of the conceptual model and framework that will be developed. Key to this model will be the integration of floodplain processes in river management decisions where we anticipate major benefits as a result of including greater flexibility in reservoir operations when combined with floodplain restoration objectives. This project will also support other CalFed programs and goals, including improving **water quality** for all beneficial uses, and contributing to the expansion of water markets.

V. TECHNICAL FEASIBILITY AND TIMING

No environmental compliance is required for this work nor do any constraints to its schedule or its completion exist. The project develops an implementation strategy and analyses will be useful in guiding a hydrogeomorphic- and ecologically-based approach to water acquisition in the lowland rivers of the Central Valley.

All phases of work on this project will inform and enhance future work by TPL and others in the acquisition of water rights and purchase of conservation easements or fee title ownership in river corridors that provide critical ecological benefits to priority species. These acquisitions will also serve to support alternative flood management regimes, channel migration, habitat restoration, and improvement in water quality. Implementation success will be evaluated on a project-by-project basis, however, and as a result cannot be evaluated at this time.

VI. MONITORING AND DATA COLLECTION

Biological/Ecological Objectives

Our overarching hypothesis is that an appropriate river management regime which incorporates physical as well as ecological processes will ultimately lead to greater success in ecosystem restoration efforts. Applying the methodology, framework, and basin study we propose to develop can test this hypothesis. As a result of this work, other related hypotheses can also be tested. For example, "How does the diversity of instream habitat types change in response to changes in flow regimes and subsequent alterations of geomorphic processes in the downstream channel? Or, "How does the inundation of floodplain lands for defined periods during the spring months increase the size and success of out migrating juvenile salmonids?" Attributes that could be measured as a result of re-operation of reservoirs include number of redds and species productivity, as well as channel erosion and deposition, aquatic habitat characteristics, establishment of riparian vegetation, benthic macroinvertebrate production, etc. Management strategies may be modified as new data is collected using an adaptive management approach.

We will submit reports describing a conceptual model for a restoration hydrograph, a water acquisition framework, a basin management and alternative analysis assessment, computer model results, and associated technical analyses generated as part of each Phase. Traditional data collection and monitoring are not associated with the development of the methodology, framework, or basin study. The collection of new hydrogeomorphic, biological and ecological data subsequent to this project and application of the restoration hydrograph methodology and water acquisition framework in a given stream would feed directly into CMARP, expanding databases and improving our collective understanding of how critical ecosystems function. Future monitoring programs should include all geomorphic and ecological data that will help track the progress of restoration efforts and provide feedback to adaptive management plans.

VII. LOCAL INVOLVEMENT

TPL intends to use the conceptual model of a restoration hydrograph and water acquisition framework to guide our Western Rivers Program. The mission of the program is to preserve and restore naturally functioning rivers and improve water quality through market-based solutions. These solutions could include purchase of recognized property rights, including land and water rights, diversion rights, hydropower rights, etc., for conservation purposes. Actual acquisitions will involve only willing sellers and will be done in coordination with and outreach to local interested parties, including local, state and federal government. **TPL has a strong track record of working with local government and interest groups to generate support for our conservation acquisitions.** We consider this support to be critical to success of our projects.

Further, the Western Rivers Program will benefit from the knowledge of a **Rivers Focus Group**, consisting of landscape and riverine ecologists, hydrologists, fishery biologists, environmental advocates, water industry leaders, state and federal agency leaders, water attorneys, and others familiar with water management, policy, and politics in the Central Valley and the West. **This multi-disciplinary advisory group will inform and refine the Western Rivers Program strategic plan and mission as well as provide technical guidance on particular issues as necessary.** We intend to use the results of Phase I, II, and III as a resource for this group in guiding our efforts. This group will meet at the outset of the project and will remain in contact with project staff for the duration of the project via conference call, email, and fax. Stakeholders and other interested parties, including landowners, environmental groups, watershed conservancies, federal and state agencies, etc., with specific in-basin knowledge, would be identified on a project-by-project basis.

In addition to assistance from this group, **Technical Advisory Committees (TACs)** will be established for each Phase of work for the project proposed herein. The TACs will **provide strictly technical guidance to the project staff in scoping at the beginning of each Phase and review of model outputs and reports as work progresses.** Local involvement, including a variety of stakeholders, including landowners and water districts, and agencies including the US Department of Interior and the state Department of Water Resources, will occur during Phase III. The TAC for Phase III will also include local experts that will provide invaluable information for the Pilot Basin Study. The TACs will meet for a one-day session at the outset of each Phase, and afterwards will remain in communication with the project staff via conference call, email, and fax.

VIII. COST

A cost estimate has been prepared for each phase of this budget on a quarterly basis, as shown in **Tables A and B**, with detailed information attached as **Exhibit 1**.

Tasks associated with Project Management include quarterly reporting, administration of subcontracts, and development and conduct of a final project presentation and are detailed in **Table B** and **Exhibit 1**.

Costs are summarized in **Tables A** and **B** represent costs incurred by TPL and contract costs for consultants PWA and Holland, who are joint participants in this proposal. Overhead and indirect costs for TPL are 50% of direct salary and benefits. TPL is a national organization with significant in-house resources, including legal staff, charitable development, public affairs, and finance departments. PWA and Hollands costs are set forth in detail in **Exhibit 1** and consist of a fixed hourly rate of \$90/hour and \$65/hour respectively. PWA rate reflects the firm's real cost of doing business, as indicated in an audit of the firm conducted by PWA's federal rate methodology has been reviewed by the Defense Contracting Audit Agency for conformance to FAR regulation methodology and found to be in conformance. These amounts represent the firm's true cost of doing business including a 10% fee. As a private consulting firm, all indirect, overhead, benefits, and direct costs incurred by PWA must be covered by client contracts.

Schedule

Assuming a start date of October 1, 1999, we anticipate the following schedule of completion dates:

Phase I	June 30, 2000
Phase II	December 31, 2000
Phase III	
Basin selection	March 15, 2001
Final Report	December 31, 2001

If agreeable to the funding entity, work on each component would be billed monthly on a time and materials basis as actual costs are incurred, not to exceed the total projected for each phase.

In general, we have assumed that each of these phases would be implemented sequentially and would build from one phase to the next. To the extent that funding is initially received for only one or more of the initial phases, additional fundraising efforts may be undertaken to develop funds for subsequent phases even as work on the initial phases is being completed. Each phase is entirely separable from subsequent phases.

Table A Project Budget Summary

Task	TPL Direct Labor Hours	TPL Direct Salary and Benefits	Service Contract(PWA & Holland)	Material and Acquisition Costs	Misc. and other Direct Costs	Overhead and Indirect Costs²	Total Cost
Phase I	70	\$4,087	\$64,540	\$0	\$17,100	\$2,043	\$87,770
Phase II	178	\$10,392	\$33,840	\$0	\$15,900	\$5,196	\$65,327
Phase III	142	\$8,290	\$97,280	\$0	\$31,550	\$4,145	\$141,265
Total:	390	\$22,769	\$195,660	\$0	\$64,550	\$11,384	\$294,362

See **Exhibit 1** for task and Phase details.

Table B. Project Budget by Quarter

	Oct-Dec 99	Jan-Mar 00	Apr-Jun 00	Jul-Sep 00	Oct-Dec 00	Jan-Mar 01	Apr-Jun 01	Jul-Sep 01	Oct-Dec 01
Ph. I	\$18,211	\$31,155	\$32,342	-	-	-	-	-	-
Ph. I PM	\$1,781	\$1,070	\$3,211	-	-	-	-	-	-
Ph. I total	\$19,991	\$32,226	\$35,553						
Ph. II	-	-	-	\$20,979	\$24,146	-	-	-	-
Ph. II PM	-	-	-	\$1,771	\$2,831	-	-	-	-
Ph. II total				\$22,750	\$42,578				
Ph. III						\$27,617	\$21,231	\$27,957	\$25,077
Ph. III PM						\$1,781	\$1,070	\$1,070	\$3,911
Ph. III total						\$37,598	\$23,252	\$40,127	\$40,288

See Exhibit 1 for task and Phase details.

IX. COST-SHARING

TPL requests funding in the amount of \$294,362 to cover completion of all three Phases of work. Phase I – completion of the conceptual model for river restoration - will cost \$87,770; Phase II – development of the water acquisition framework - will cost \$65,327; and Phase III – pilot basin study - will cost \$141,265. Phase I is separable from the latter two phases, whereas Phase II is dependent on the completion of Phase I and Phase III is dependent on the completion of the two earlier phases. TPL is also seeking funding from the Packard Foundation, the Crocker Foundation, and others to complement anticipated CalFed funding, and in support of TPL's new Western Rivers Program, through which this methodology and framework will be applied.

The mission of the program is to preserve and restore naturally functioning rivers and improve flood management and water quality through market-based solutions. These solutions could include purchase of recognized property rights, including land and water rights, diversion rights, hydropower rights, etc., for conservation purposes.

TPL will act as Project Manager, with assistance from consultant Elise Holland, who has expertise in fisheries biology and stream ecology, and from consultant Philip Williams & Associates LTD, which has expertise in hydrology and related disciplines, throughout all three phases of work. TPL's will provide oversight of technical work, consulting on particular project elements, and administrative support during report production and distribution.

X. APPLICANT QUALIFICATIONS

The Trust for Public Land (TPL), as applicant, will manage and oversee the grant as well as the efforts of our consultants, Phil Williams and Associates, Ltd. and Elise Holland. TPL is a national, nonprofit conservation organization with over 26 years of experience in acquiring critical land and water resources from willing sellers for restoration and preservation. To date, TPL has acquired and conveyed into protective public or nonprofit stewardship over 1 million acres in the United States valued at over \$1.4 billion dollars. TPL's core competencies are in business, finance, law and real estate. The Western Rivers Program is a new initiative through which TPL seeks to preserve and restore naturally functioning rivers and improve water quality through market-based solutions. Potential market-based solutions could include purchase of recognized property rights, including land and water rights, diversion rights, hydropower rights, etc., for conservation purposes. The Western Rivers Program intends to use the conceptual model for a restoration hydrograph, the water acquisition framework, the basin management alternatives analysis assessment, computer model results, and associated technical analyses generated as part of each Phase to guide our water and land acquisition efforts in California, and if applicable, to the Western United States.

The Western Rivers Program builds upon the past success and experience of our existing California Rivers Program. Under the leadership of Nelson Mathews, Western Rivers Program Director, the California Rivers Program successfully completed projects ranging from the acquisition of the 16,000+ acre Grass Valley Creek Watershed on the Trinity River for restoration of salmon and steelhead habitat, to the conservation purchase of water rights from Battle Creek, to the preservation of key properties within the San Joaquin River Parkway. Nelson, a lawyer by training, has 8 years experience with negotiating and managing complex real estate and water rights conservation acquisitions as well as program management. Nelson will be assisted by TPL's legal, project, finance, and development staff.

Elise Holland, who has experience in fisheries biology and stream ecology, will serve as consultant to TPL on the various biological and ecological aspects of the analyses in Phases I, II, and III, as well as on future acquisitions undertaken by TPL as part of the Western Rivers Program. Elise has academic training in Biochemistry and Natural Resource Management. For the past several years, Elise has been the Director of the Fisheries Program at The Bay Institute (TBI), a non-profit organization that focuses on the restoration of the Bay-Delta watershed – particularly its fisheries. At TBI, Elise focused on the management, conservation, and restoration of important fisheries in the Central Valley watershed through her role on a variety of CalFed technical workgroups, and through her role in the creation and implementation of various state and federal agency initiatives. Most of her efforts were focused on the conflict between water diversion and fish protection in the Delta. She provided technical guidance on fisheries related issues to the greater environmental community particularly those associated with the implementation of the state and federal Endangered Species Acts and the Central Valley Project Improvement Act. Prior to her work in California, Elise taught stream and wetlands science courses in Oregon. She has also served as a technical analyst and advisor to Congressional committees on fisheries and water diversion issues, and as a private consultant on other land- and water-use issues.

Philip Williams & Associates, Ltd. is an internationally-recognized leader in the integrated management of river systems to meet both social and ecological goals. The firm's founder and president, Philip B. Williams, Ph.D., P.E., was one of the first proponents in the engineering field of a truly integrated approach to multiple-objective river management. PWA has a staff of 27 and offices in both the San Francisco Bay Area (Corte Madera, CA) and the Pacific Northwest (Portland, OR).

The firm has completed more than 1300 projects in the field of hydrology in the past 22 years, including recent work with the U.S. Army Corps of Engineers in the development of the landmark Napa River flood control project. The PWA technical staff include an unusual combination of engineers and geomorphologists, expertise that is excellently suited to the technical requirements associated with this proposal and the new demands of river management.

(Elizabeth) Betty Andrews, P.E., Principal at PWA, will act as the Technical Manager for

the project and will oversee and manage all activities of the PWA staff on the project. She has expertise in the areas of floodplain restoration, river management and modeling, and flood hazard management. An example of her work in this multi-objective arena is the development of a 1997 floodplain restoration assessment and plan for The Nature Conservancy on the Cosumnes River in California. She is also a member of the Floodplain Management Association, and has overseen several large flood hazard studies for the Federal Emergency Management Agency, and has worked with both the US Fish and Wildlife Service and the US Bureau of Reclamation on water management planning for implementation of the Central Valley Project Improvement Act.

Nelson Mathews, TPL, will serve as the overall Project Manager on all phases of the proposed project. Besides his project management responsibilities, he will act as the primary liaison with the Technical Advisory Committee on each phase of the project. He will also offer specialized expertise in the realm of water acquisition, and will provide consistent direction to ensure the practical applicability of the work products generated during each phase of the project. He will be assisted by Elise Holland, who will provide the project team with expertise on ecological processes in general and fisheries restoration in particular.

Betty Andrews, PWA, will act as the Technical Manager for the project, overseeing the PWA staff contributions to the effort and advising the Project Manager on technical aspects of the overall project.

PWA staff will perform the majority of the work effort on Phases I and III; TPL staff will perform the majority of the work effort on Phase II.

XI. COMPLIANCE WITH STANDARD TERMS AND CONDITIONS

The applicant will comply with standard terms and conditions associated with a CALFED grant award on or before the signing of final contract.

Integrated Model for River Restoration and Water Acquisition

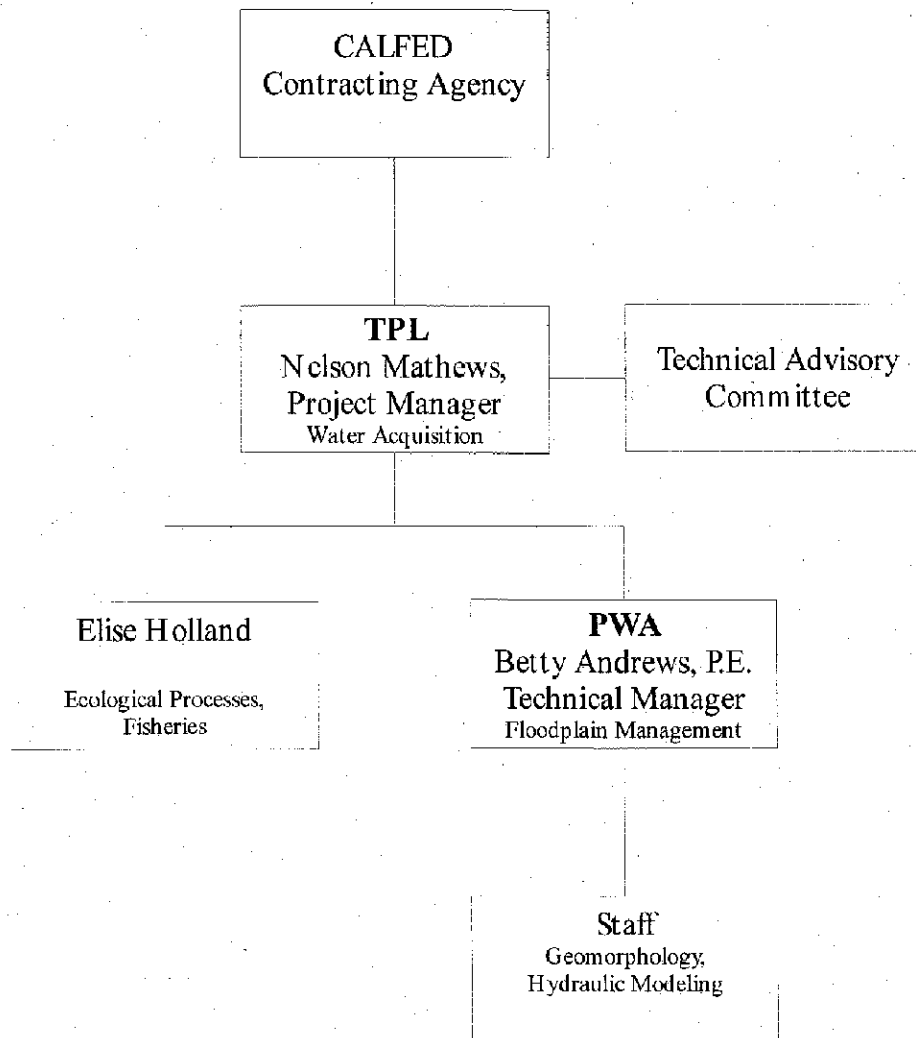


EXHIBIT 1
AN INTEGRATED MODEL FOR RIVER RESTORATION AND WATER ACQUISITION IN THE CENTRAL VALLEY
ameworX

[illegible]

NONDISCRIMINATION COMPLIANCE STATEMENT

STD. 19 (REV. 3-85) PWC

COMPANY NAME

The Trust for Public Land

The company named above (hereinafter referred to as "prospective contractor") hereby certifies, unless specifically exempted, compliance with Government Code Section 12990 (a-f) and California Code of Regulations, Title 2, Division 4, Chapter 5 in matters relating to reporting requirements and the development, implementation and maintenance of a Nondiscrimination Program. Prospective contractor agrees not to unlawfully discriminate, harass or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, disability (including HIV and AIDS), medical condition (cancer), age, marital status, denial of family and medical care leave and denial of pregnancy disability leave.

CERTIFICATION

I, the official named below, hereby swear that I am duly authorized to legally bind the prospective contractor to the above described certification. I am fully aware that this certification, executed on the date and in the county below, is made under penalty of perjury under the laws of the State of California.

OFFICIAL'S NAME

Reed Holderman

DATE EXECUTED

April 15, 1999

EXECUTED IN THE COUNTY OF
San Francisco

PROSPECTIVE CONTRACTOR'S SIGNATURE

PROSPECTIVE CONTRACTOR'S TITLE

Vice President, Director Western Region, Trust for Public Land

PROSPECTIVE CONTRACTOR'S LEGAL BUSINESS NAME

Trust for Public Land, a California Public Benefit Corporation